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by 24 feet high. The lenses alone would cost £8,400, an expenditure which would only be justified by the necessity for an exceptionally powerful light.

Mr. D. A. Stevenson, Engineer to the Northern Lighthouse Board, in a report on electric light as an illuminant, claims that the complaints against the penetration of this light in fogs are not well founded, and that many criticisms of its power are due to prejudice, partly owing to the persistent way in which it is decried as a lighthouse illuminant by certain writers to the press, partly from a misunderstanding of the fact that, being very rich in the most refrangible rays of the spectrum, that is, very white, it suffers a greater percentage of diminution in passing through fog than oil or gas light, which is redder, but nevertheless, owing to its enormously greater initial power, the electric light is always a better penetrator of fog than the others. He claims that sailors, on their ordinary courses, are never in a position to form an opinion of the subject that is worth anything, because they cannot see different lights in the same conditions of atmosphere. He adduces observations made by keepers in his service on each other's lights, which go to prove that the electric light is in all cases the more powerful. These are observations from one station burning an oil light to another electrically lighted, and the reverse. Three pairs of such stations are instanced; in every case the electric light being visible in fog that totally obscured the oil lamp.

THE COLLECTION OF FOSSIL MAMMALS IN THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK.

BY HENRY F. OSBORN, COLUMBIA COLLEGE, NEW YORK CITY.

THE third expedition from the Museum is now in the field, and the collections of fossil mammals made under the direction of Dr. J. L. Wortman during the summers of 1891 and 1892, are being rapidly prepared for exhibition upon the geological floor of the museum. The first year's work was in the Wahsatch beds of the Big Horn Mountains, a country which had been very thoroughly explored for Professor Cope. This yielded rather disappointing results, although exceptionally fine material of *Coryphodon* was procured, including very considerable portions of the skeleton, which will soon be mounted for exhibition in the museum. The most unique discovery in this horizon was the skull of *Palæonictis*, an ancient carnivore which has hitherto been represented only by two lower jaws found in the Suessonian of France, the horizon contemporary with the Wahsatch.

Early in 1892 Dr. Wortman, accompanied by Mr. Peterson, who had been for several years on the U. S. Geological Survey, started into the Puerco or basal Eocene beds of northern New Mexico, and by the most energetic and careful search in fields which had also been explored for Professor Cope, succeeded in procuring a very valuable collection of these Lower Eocene types. Among the most unique specimens of this series are the upper and lower jaws of *Polymastodon*, a large-sized successor of the ancient *Plagiolax* of the Middle Jurassic beds. Another discovery was the skull of *Pantolambda*, an ancestor of *Coryphodon*. Altogether nearly five hundred specimens were shipped East from this tour. The party then went into the Laramie, in search of the Triceratops, but were unsuccessful. They secured later in this horizon a large collection of the minute teeth of the Cretaceous mammals, which is paralleled only by that in the U. S. Geological Survey collection.

The richest results obtained thus far, however, are from the White River Miocene of South Dakota. Here the beds are 800 feet thick, and a thorough exploration was made from the bottom series in which the huge *Titanotherium* is found, to the top in which the new forms *Protoceras*, *Artionyx* and *Aceratherium tridactylum* were found. These top beds were practically a discovery, for nothing has been recorded from this stratum before, excepting the skull of a female *Protoceras*, which is in the U. S. Geological Survey collection. The male *Protoceras* presents four pairs of protuberances upon the skull, the most exceptional being the large vertical plates upon the maxillaries. This White River Miocene is the classic ground of Leidy's memoirs, but in these and by far the greater part of the literature

of this horizon, the animals only of the so-called "Oreodon" stratum have been described, together with the forms from the lower "Titanotherium" stratum. This has been due to the fact that these strata at once attract the ordinary collector by the profusion of bones which are washed out from them. An intervening stratum between the "Oreodon" and "Titanotherium" layer, appears, also, to have been generally overlooked, because of its unpromising exterior. Mr. S. Garman, collecting for the Museum of Comparative Zoölogy, some years ago secured one specimen of the very unique Rhinoceros-like form, *Metamynodon*, the type specimen and the only one which has hitherto been known. Dr. Wortman directed his attention, therefore, especially to the location of this stratum, and succeeded in finding a seam about thirty feet in thickness, which proves to be especially characterized by abundant remains of *Metamynodon*. The party secured four or five skulls, and one nearly complete skeleton. This animal is distinguished by huge canine tusks in the anterior portion of the head, which give it an appearance quite different from that of the rhinoceros; in fact, the skull and skeleton are entirely peculiar, and unlike any perissodactyl which has been found hitherto. Yet this animal flourished in the midst of large herds of true rhinoceroses, for the diligent search made by the museum party has resulted in the discovery of a whole series of hornless rhinoceroses, from the bottom of these beds to the top. They increase gradually in size, and in the evolution of the teeth, in the loss of the lateral fifth toe in the fore foot, and reach a culminating point in the new species, *Aceratherium tridactylum*. As the name indicates, this species is mainly characterized by the presence of but three toes in the fore foot. It is represented in the museum collection by one of the most remarkable specimens which has ever been found. This is a complete skeleton from the tip of the nose to the tip of the tail, lacking only the fore limb of the left side, and a few of the ribs and sternal bones. It is over seven feet long and four feet high, and has been mounted upon a large panel of sandstone and plaster, giving the impression that it has been simply hewn out of the matrix. The animal appears to be of about the same size and proportions as *Ceratorhinus* or the rhinoceros of Sumatra; in fact it has very nearly the same proportions and form, except that it lacks the small horns upon the nasals and frontals. Among American species its affinities are with the *Aphelops megalodus* Cope of the top of the Miocene.

A third specimen of note is the hind foot of *Artionyx*. As Leidy called *Oreodon* a ruminating hog, so this animal might be called a clawed hog, for the foot closely resembles that of the pig or peccary, until we reach the phalanges, which have articulations and large terminal claws somewhat similar to those seen in the bears, while the ankle-joint is of the artiodactyl type, and the four toes are set in pairs on either side of the median line, there being also the rudiment of a fifth. The name given this fossil refers to its combination of the artiodactyl and unguiculate character. This is possibly a relative of the clawed Ungulate—*Chalicotherium*—which presents such a remarkable combination of characters, and is now known to have been distributed over North America, Europe, and Asia, during Miocene times. The contrast between these two types is very striking; for while *Artionyx* combines an artiodactyl foot with uncleft claws, *Chalicotherium* combines a perissodactyl foot with cleft claws. One of the most interesting problems of the future will be clearing up the relations between these two forms and their relations to other groups.

CURRENT NOTES ON ANTHROPOLOGY.—XXVII.

[Edited by D. G. Brinton, M.D., LL.D.]

Theories in Criminal Anthropology.

Two articles which appeared almost simultaneously in February last present with sharpness and brevity the conflicting views of the two leading schools of criminal anthropology.

One is by Dr. Sorel, in the *Revue Scientifique*. It is a warm defence of the doctrines so strenuously urged by Professor Lombroso, and which were substantially repudiated at the Congress of Brussels last year (see *Science*, Nov. 18). Sorel maintains

that the opponents of Lombroso did not understand his assertions, and that they confused the discussion by introducing speculative questions as to the abstract nature of crime, quite out of place in a study in natural history; and much more to the same effect.

The other paper is by the late Professor Meynert, and is printed in the *Mittheilungen* of the Vienna Anthropological Society. It is principally occupied with a refutation of Lombroso's assertion that genius is a pathological development, or the result of such; but also attacks his theory of crime as attributable to a degeneration of the brain and a reversion to an atavistic condition of the race. Several serious errors in Lombroso's method of handling statistics are pointed out; as, for instance, his neglect of the fact that the depraved physique of the criminal is owing to his unhygienic surroundings, and to attribute his criminality to such physique is to confuse concomitant with cause. Again, in comparing criminals with wild beasts, he confounds the methods of natural history with that of judicial procedure.

A careful reading of the two articles will prove entertaining.

A Chemical Test of the Antiquity of Bones.

The effort was made by M. Adolphe Carnot last summer, in a paper read before the Académie des Sciences, Paris, to establish a chemical measure of the antiquity of bones. He claimed that this is shown by the amount of fluorine they contain. Its relative proportion increases as the bones are older. Representing the maximum by 1, modern bones show but .06, those from the old quaternary strata .35, those from the tertiary .64. Hence, when human and other bones are found in the same strata, and the question whether they should be assigned to the same age arises, analysis is claimed to offer a solution; and M. Emile Rivière had recourse to it as the crucial test in the disputed age of some human bones found along with those of extinct species in the gravels near Billancourt, on the Seine; proving, he believed, that the human bones were intrusive and late.

It seems to me, however, that this test, which I learn about from an abstract in the *Journal de l'Alliance Scientifique*, March 15, is open to some serious risks.

Not only do the inorganic constituents of bone differ largely in the different osseous tissues of the same skeleton, but they notoriously vary greatly at the different epochs of life. According to the analyses of Heintz, the fluoride of calcium in the average femur of an adult is about 3.5 of its inorganic constituents. Where the proportion in ancient bones differs notably from that in modern, how can we decide what part of it is owing to post mortem changes conditioned on the quality of the soil, the amount of percolation, the length of exposure before inhumation, and the like incidents? While it would be most desirable to have at hand a positive chemical test of antiquity, we must hesitate to accept as conclusive one which seems exposed to be influenced by these precarious conditions.

Cave-Hunting on the Mediterranean.

Shortly after leaving the French frontier on the road which leads from Marseilles to Genoa, the track penetrates by a tunnel the Baoussé Roussé, or Red Rocks, the sea front of which is perforated with natural caverns looking out on the blue Mediterranean. They have furnished rich mines for the archæologist, as they were selected by the earliest of the human race who dwelt there as favorite resting-places for both the living and the dead. Fresh discoveries were made in one of the grottoes in February, 1892, of which a note will be found in *Science*, July 26, 1892, giving the opinion of J. Vaughan Jennings. A still more elaborate study was made by Dr. Verneau, which appears in *L'Anthropologie*, 1892, No. 5. His conclusions, briefly, are that the three skeletons found side by side were an interment dating from a period intermediate between the quaternary and the neolithic epochs; but it had been made in strata containing traces of an older and different industry, which could properly be called quaternary.

Some excavations of MM. Fournier and Rivière, published in *Le Naturaliste*, Feb. 15, 1893, revealed a station of the Magdalenian epoch in a rock-shelter at La Corbière, near Marseilles,

and probably as ancient a relic-bearing stratum as has been found in that district.

A curious fact about it was that at the remotest corner of the small grotto was a skeleton, the bones in place, but with no signs of interment, and no funerary objects. Evidently the corpse had been left to decay where the man breathed his last. Either he lived alone, or the others had deserted the grotto on his death. The authors refer to another such instance in another shelter. Probably in these, we see the signs of that horror of death which is one of the earliest prompters of the religious instinct. Tribes are known to history who deserted the dwelling and the corpse within it, when the owner died.

Researches in Early Aryan Ethnology.

One of the most earnest students of the early Aryan tribes is Professor Wilhelm Tomaschek, of the University of Vienna. In a late number of the *Mittheilungen* of the Anthropological Society of that city he discusses with profound erudition the relationship of the ancient Illyrians and Thracians.

In its first paragraphs he declares himself a believer that the primitive Aryan speech developed itself in Europe, wholly uninfluenced by either Semitic, Coptic, or other affiliations. From an extended comparison of the relics of ancient Illyrian and Thracian — principally proper names — he reaches the conclusion that the east European group of Aryan tongues should be divided into two sub-groups, the one including the Thracian, Phrygian, and Armenian, the analogies of which are with the Celtic and Italic dialects of western Europe; the other comprising the Slavic and Illyrian idioms, whose analogies are with the Lithuanian of the Baltic. The modern Albanian is a true descendant of the Illyrian, though it has suffered much decay, and also presents a number of non-Aryan radicals, which, the author ventures to suggest, survived from the pre-Aryan Ligurian speech of the locality. The Veneti of northern, and the Iapyges of southern Italy belonged without doubt to the Illyrian stock. The Thracian language itself, a pure Indo-Germanic tongue, became entirely extinct; but the author announces the near publication of a work in which he has collected all known relics of it as preserved in epitaphs, inscriptions, and proper names.

The Study of Folk-Tales.

A valuable addition to the science of folk-lore is a work just published by the English Folk-lore Society, from the pen of Miss Marian R. Cox. It is a volume of 535 pages, a monograph on the tale of Cinderella, giving 345 variants, with abundant notes and discussions of analogous narratives from all parts of the world and all periods of history.

An introduction is contributed to the work by Mr. Andrew Lang, in which he endeavors to present what he now believes to be the true explanation of such analogies, carefully refuting various opinions on the subject which he is generally believed to have endorsed. Mr. Lang was once president of the Folk-lore Society, and though he has announced that he has given up that for more lucrative pursuits, his opinions are much respected. He is generally understood to have explained such analogies by the convenient word "chance," and to have been the adherent, if not the parent, of the "casual" theory in folk-lore. Certainly he has denied all definite meaning and all real content in primitive myths. He now modifies these positions by explaining the analogies as based on "the universally human," or else on "common customs." He believes in transmission, "where the incidents are numerous and the sequence exact"; which, indeed, is the only resource for one who, like Mr. Lang, can see nothing in native myths but "the obscene or puerile stories of savages."

Fortunately, we are not driven to take refuge in such vague phrases to explain the striking parallelisms of human thought and expression in tribes far apart in space and time. The scientific explanation of them is based on two factors; first, the fixed laws of the human imagination; and second, the objective reality of the sequences which are symbolically set forth in the narratives. The late story is often the ancient nature myth, decked out by personification and poetry, but still true to those sequences which objectively are ever and everywhere realities.

As for the imagination, what is it but a faculty operating under laws as rigid as those of physics? As the distinguished ethnographer, Von Hellwald, remarks: "In spite of the endless multiplicity of forms, yet often one and the same or very nearly allied forms recur in localities widely asunder, and this seems to occur most frequently in forms which are peculiarly strange and artificial. We are almost forced to accept the discouraging suggestion of Peschel, that the human faculty of thought is a mere mechanism, which under a given stimulus is always forced to perform the same motion."

LETTERS TO THE EDITOR.

* * * Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

A Physiological Effect of Cave Visiting.

DR. HOVEY's interesting account of a visit to the Mammoth Cave in March, published in *Science* for April 7, 1893, recalled a recent conversation with my father, Dr. C. Fayette Taylor, on the subject of the cave, which he visited in July, 1860. He was particularly struck with, and vividly describes, the physiological effects experienced on emerging from the cave. He made the usual long trip with some fifteen companions, reaching upper air after a stay of about twelve hours under ground. On emerging the sense of smell was intensified to such an extraordinary degree, that most common objects, such as trees, plants, animals, and even people had strong individual odors, mostly unpleasant; about half the party were strongly nauseated and vomited. One tree could easily be distinguished from another by its characteristic odor. This effect lasted about half an hour and then passed off. The guides told him that this was a usual experience. Dr. Hovey alludes to this effect of a sojourn in the cave in a lecture published in the *Bulletin of the American Geographical Society*, March 31, 1891, in the following words: "By contrast with the pure oxygenated air of the cave, the odors of the outside world, of the trees, grass, weeds, and flowers, are strangely intensified and for many delicate natures overpowering." In a letter dated April 11, 1893, Dr. Hovey says: "I have always, or generally, been accustomed to rest at the entrance on emerging, for the reason that neglecting this precaution is apt to be followed by disagreeable consequences. I have known visitors to suffer from nausea and headaches by reason of a too sudden change from the peculiarly pure air of the cave to that of the outside world. The sense of smell is greatly intensified in almost every case."

I judge that this intensification of olfactory perceptions is due to the rarity of olfactory stimuli in the cave; on emergence, in accordance with a physiological law, the perceptive powers for these particular stimuli, having rested, are intensified, so that odors too delicate to make an impression under ordinary circumstances are powerfully felt. By the constant repetition of the ordinary olfactory stimuli this effect passes off, and soon only the stronger odors are registered in consciousness. In other words, consciousness is mainly concerned with the registration of the contrast between the stimulus of the moment and a background of fused and undifferentiated impressions. Ordinarily, sensations are increased by more intense stimulation, but they may also be increased, as in the illustration just given, by varying the background so as to bring ordinary stimuli into stronger relief. That a similar effect has been intensified by heredity is illustrated by Dr. Hovey's remarks on the auditory sensitiveness of the cave fauna. He says in the lecture already referred to: "The tiny [blind] fish are colorless, having cartilage instead of bones, are viviparous, and are so sensitive that if a grain of sand should fall on the water they would dart away with rapidity. Blind crawfish are also found here, whitish, semi-transparent, with remarkably long antennæ and more delicate in

every way than those found in outside streams. These also are highly sensitive and not easily captured."

This agrees with an observation of Professor Cope, quoted in the "Standard Natural History," Vol. III., p. 173. He says the Amblyopses, when swimming near the surface, as is their habit, are "easily taken by the hand or net, if perfect silence be preserved, for they are unconscious of the presence of an enemy, except through the sense of hearing. This sense is, however, evidently very acute, for, at any noise, they turn suddenly downward and hide beneath stones, etc., at the bottom."

HENRY LING TAYLOR, M.D.

New York.

Pre-Historic Remains in America.

IF Professor Thomas, in *Science*, May 5, had really desired to inform readers what my conclusion was in reference to the original home of the Mexican or Uto-Aztecan stock, he would have quoted, not various fragments from earlier studies, but the following from "The American Race," p. 121: "That very careful student, Mr. George Gibbs, from a review of all the indications, reached the conclusion that the whole group came originally from the east of the Rocky Mountain chain, and that the home of its ancestral horde was somewhere between these mountains and the Great Lakes. This is an opinion I have also reached from an independent study of the subject, and I believe it is as near as we can get to the birthplace of this important stock."

What I said of the Mayas was: "The uniform assertion of their legends is that the ancestors of the stock came from a more northern latitude, following down the shore of the Gulf of Mexico."

If Professor Thomas can controvert either of these propositions, I shall be glad to change my views to his.

As for his assertion that I "ought to know" that the shells and copper ornaments found in Tennessee and Georgia "are looked upon by all archaeologists as puzzling objects because of their remarkable departure from the types of the Atlantic slope," I certainly know nothing of the kind, nor does Professor Thomas. Only last summer that most competent archaeologist, Dr. E. Seler, published an article to show that these very objects are so little of a departure from historic Atlantic types that the theory of a relationship to Maya art is in his opinion unnecessary (see *Science*, Nov. 4, 1892).

If Professor Thomas had made himself acquainted with the current literature of American archaeology, he would not have risked such a statement.

D. G. BRINTON.

Philadelphia, May 8.

Tornadoes.

ABOUT five o'clock of the evening of April 24, a peculiar wavy appearance was noticed in the clouds, which were moving north. Every few minutes one or more miniature tornadoes would appear. The little funnels would last twenty or thirty seconds, others formed only to be destroyed shortly afterwards.

The whole time was about fifteen minutes, when the upper layers of clouds became more or less mingled with the lower layers. The barometer had been falling all day. The same evening there were two destructive tornadoes in Missouri and a heavy wind-storm at Paxton, Ind.

E. M. DANGLADE.

Vevay, Ind., April 29.

Pivotal Sounds in Recollection.

IN 1884 I published the statement that in the endeavor to recall some forgotten word or name that a remarkable tendency existed to substitute another word or name having, somewhere in its construction, a letter corresponding to one in the desired word or name. For example, Cavendish suggests itself, or rather may do so, when one is trying to recollect Van Antwerp, and so on; the V being the pivot upon which both names revolve, apparently, in the memory. In addition to this I find, at least in my own experience, an inclination to swing these memory efforts around the R sound more frequently than with other instances; for example,